DENVER TP - Series

Service Manual
Electronic Precision and Gold Models

incl. Spare Parts List and Service Specifications

DENVER INSTRUMENT

General Information

Service Concept

All repair service, including diagnostics, should be performed at a well equipped repair center.
Spare Parts are available in sets (see the list on page 15).
If the strain-gauge load receptor should become defective, the entire balance/scale should be replaced.

Overview of TP mode

Status: 03/98
TP-214 , TP-114 , TP-313 , TP-213 , TP-3102 , TP-2102 , TP-1102 , TP-602 , TP-6101 , TP-4101 , TP-2101

Service Tools and Equipment

In addition to standard tools, you will need the following special tools to work on the Basic^{lite} Series and Gold Series balances/scales:

Qty. Designation	Order no.
BPI adapter/service data output port	6740-71
Sartocas service software. version 1.30 or later, and	6740-33
RS-232 cable for connecting the balance/scale to PC or	7357312
CAS Psion Server, version 4.6 or later	6379-98

Accompanying Literature

Installation and Operating Instructions for Basic^{lite} and Gold Series Balances/Scales

Operating the Balance/Scale

Functions of the Keys

I /O   On/off
CF   Clear function. Used to interrupt/cancel functions.
F   Function key. Starts the selected application program.
     (To display selected reference sample quantity or percentage, press
   and hold this key for approx. 2 seconds.)
     Print key.
TARE   Tare key. (To start calibration/adjustment, press and hold this key
     for approx. 2 seconds.)

Balance/Scale Operating Menu

Accessing the Balance/Scale Operating Menu and Changing the Settings

Accessing the Menu: I /O   **+**   TARE

– Turn the balance/scale off and then turn it back on.
– Press TARE briefly while all display segments are lit.
– If "1" is displayed, the menu is locked (read-only).

If the menu is locked, change the code setting from 8-1-2 to 8-1-1. Once you store this code, the menu is accessible.

Selecting a Menu Code: ⊙ **and** TARE

– To select a certain menu code, press TARE to change the number of the digit displayed to the desired number. Numbers change in a cyclical sequence, starting at 1 again after 9 is reached.

– To select the next digit (menu level), press ⊙

Changing a Menu Code Setting: ⊙ **(press and hold)**

– To confirm the desired code setting, press the ⊙. for approx. 2 seconds. The superscript "**o**" is displayed to indicate that this is the current setting.

– To exit the balance/scale operating menu and store the new settings, TARE press t for approx. 2 seconds.

– To exit the balance/scale operating menu without storing any changes to the settings, press I /O .
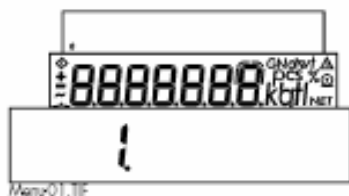
Note:
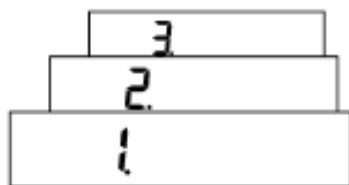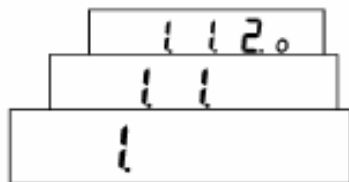
Activating the BPI Mode

The BPI mode must be activated in the balance/scale before you can work with the service software. You need to use this software, for example, to adjust:

– the span after the zero-point offst was changed
– the linearity and/or
– after replacing a PCB.

The BPI adapter (part no. 6740-71) must be connected to the balance/scale before the BPI mode can be activated. The procedure for connecting the adapter is as follows:
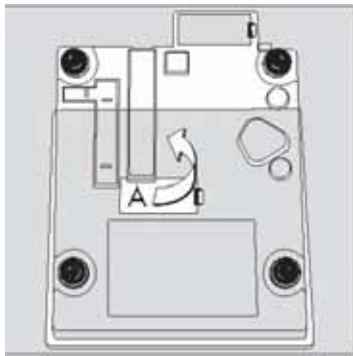
Data-01.EPS

– Turn off the balance/scale and disconnect it from the power supply
– Remove the weighing pan
– Remove the protective cap (A) from the bottom of the balance/scale.
– The main PCB is now accessible through an opening in the balance/scale housing.
– Connect the white plug on the cable of BPI adapter to the corresponding position on the main PCB.
– Connect the plug on the power cable of the BPI adapter to the power jack on the balance/scale.
– Plug the balance/scale AC adapter into the power jack on the BPI adapter.

The equipment is now connected as follows:
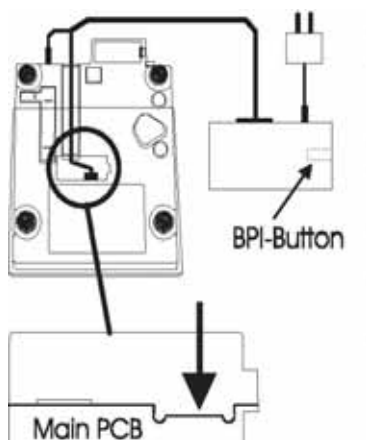
BPI-01e.EPS

– The balance/scale has a 25-pin RS-232 interface for the service software
– There is a seperate power supply to the balance/scale so that the BPI mode can be activated (only with batery not possible).

– Replace the weighing pan and turn on the balance/scale.
– When 0.0 is displayed, use a suitable tool to press and hold the button on the BPI adapter (accessible through an opening in the housing.
– The balance/scale now performs its self-test (display segment check) repeatedly.
– Wait until the segment check has lit up at least 3 times; then press the button again.
– The balance/scale electronics are now in the BPI mode and you can use the balance/scale with the service software.

Caution!   **After working in the BPI mode, make sure to set the write-protect again (using the "Close" function in the service software program) so that the bal-ance/scale returns to the SBI mode (SBI = serial balance interface; this is the standard data transfer protocol). Otherwise you will not be able to operate peripheral devices with the balance/scale; when $\boxed{\odot}$ is pressed, the error code "Ł ∃ʊ´ " is displayed.**

Calibrating/Adjusting the Balance/Scale

Calibration/Adjustment Sequence

After installation, or following maintenance or repair work, check and, if necessary, adjust the following factors:

1. Overload stop
2. Zero-point offset value
3. Off-center load
4. Linearity
5. Span

Adjusting the Overload Stops

The overload stop must be reset after the strain-gauge load receptor has been damaged or replaced. Weight readouts greater than the balance/scale's maximum capacity must be read off. The service software is required for this procedure.

– Activate the BPI mode (see page 5)
– Service software: Select the "Diagnostics" program; then select the
  "High Resolution" subprogram
– When adjusting the overload stop, read off the weight value shown on the
  Psion server or PC display
– After adjusting the overload stop, activate the "Close" function in the
  service software to reset the balance/scale to the SBI mode.

Balance/Scale Type	Test Weights
TP-214	280g ± 10%
TP-114	140g ± 10%
TP-313	400g ± 10%
TP-213	280g ± 10%
TP-3102	3500g ± 10%
TP-2102	2400g ± 10%
TP-1102	1400g ± 10%
TP-6101	6500g ± 10%
TP-4101	4500g ± 10%
TP-2101	2500g ± 10%
TP-602	700g ± 10%
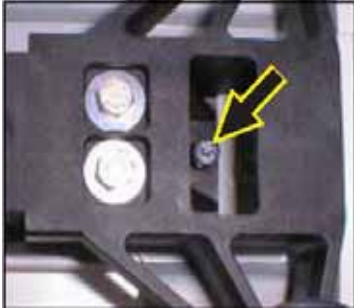
Adjusting the Center-load Stop

Anschl01.JPG

– Open the balance/scale (see page 9) and then reconnect it to the power supply
– Center the required test weight and an additional 200 g (corresponds to the weight of the weighing pan and the shock absorber) on the weighing pan.
– The service software display shows a stable weight readout
– Adjust the stop screw inward until the overload limit is just reached
– The weight readout is no longer stable
– Adjust the stop screw ½ turn outward
– The center-load stop is now properly adjusted

– On balances and scales with a round pan, there are two overload screws (see arrows). Both have to be adjusted.

Anschl02.JPG

Zero-point Offset Value

The zero-point offset value adjustment is necessary for adapting the bridge voltage of the strain-gauge load receptor to the operating range of the balance/ scale electronics. This may be necessary:

.– after replacing the strain-gauge system
.– after replacing the main PCB
.– if the span cannot be adjusted (even with the service software) and the error code "e 02" is displayed
– when the zero-point offset voltage has changed and is outside the tolerance limit (e.g., due to the strain gauge load receptor being "bent")

Adjusting the Zero-point Offset Value

– Open the balance/scale (see page 9)
– Connect the cable from the digital voltmeter (DVM) to IC15, pin 6 and ground
– Place the shock absorber and the weighing pan on the balance/scale and reconnect the power supply
– Use the DVM to check the preload voltage with no load on the balance/ scale
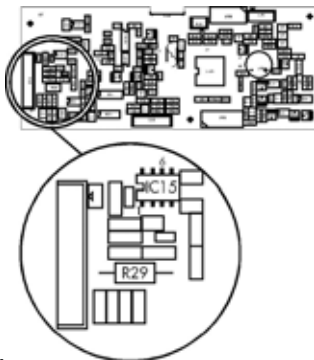
Target (mV)	A/D converter output (%)
– 0.25 to – 0.49	4.3% to 8.3%

– If the zero-point offset voltage is outside the tolerance range listed above, balancing resistor R29 must be adjusted in accordance with the table below.

Offset1.TIF

Table of Balancing Resistors

Zero-point offset voltage (V)			R29 resistance value (ohms)
2.475	-	2.310	10
2.310	-	2.144	1,800
2.144	-	1.979	3,600
1.979	-	1.813	6,200
1.813	-	1.648	9,100
1.648	-	1.482	12,000
1.482	-	1.317	15,000
1.317	-	1.151	20,000
1.151	-	0.968	27,000
0.968	-	0.820	33,000
0.820	-	0.655	43,000
0.655	-	0.489	51,000
0.489	-	0.324	68,000
0.342	-	0.158	100,000
0.158	-	-0.007	150,000

The balancing resistor must have the following specifications:
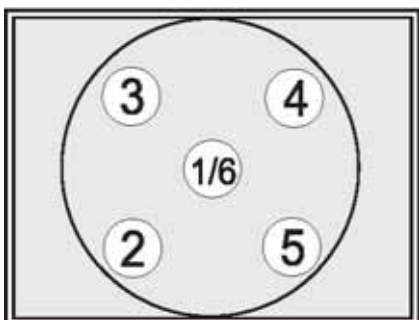
Metal film, 0.6 W, 1%, TK50

Off-center Load

Checking the Off-center Load

– Center the test weight (see "Service Specifications," page 14) on the weighing pan (position 1) and press t "0.0" is displayed (depending on model and settings)
– Place the test weight on positions 2, 3, 4 and 5 in sequence
– The absolute values displayed for all 4 positions must be within the limits listed in the service specifications (see page 14)
– If the off-center load error exceeds the tolerance listed in the service specifications in any of these 4 positions, the off-center load should be adjusted with the greatest positive error value (see "Adjusting the Off-center Load" below)

Eckl--o2.EPS

Adjusting the Off-center Load
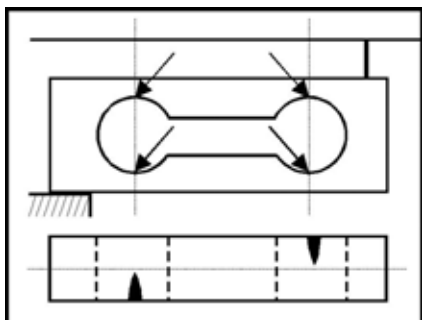
- Remove the weighing pan and any shock absorber.
- Remove the Phillips screw (A) and remove the hood.
- Remove the 2 fastening screws from the pan support (7 mm open-end wrench) and remove the pan support.
- The strain-gauge load receptor is now accessible.
- Correct the off-center load by filing on one of the thin sections. Always file the thin section that corresponds to the greatest off-center load error.

Note: Only small deviations can be adjusted. If the strain gauge load receptor is visuably bent an adjustment is not possible anymore!!

– Place the pan support on the load receptor and fasten it. Place the hood, shock absorber and weighing pan back on the balance/scale.
– Check the off-center load and readjust it if necessary.

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Linearity

Adjust the linearity using the service software.
– Activate the BPI mode (see page 7)
– Connect the balance/scale to the PC and start the linearity program
  in the service software
– Reset the balance/scale to the SBI mode by activating the "Close"
  function in the service software
– Check the span adjustment and adjust if necessary (see "Span
 Adjustment" below)

Span Adjustment

Note:

There are two ways to perform span adjustment:
1. With the service software or
2. as described in this manual

– Select the menu code "External adjustment accessible" (code 1 5 2)
– If necessary, set the weight unit for the calibration weight (code 1 4 x)
  (factory setting: "kg" – code 1 4 2)
– Unload the balance/scale and, if necessary, press TARE to tare the
  display
- Press and hold the F key for >3 sec. to activate the calibration
  routine
– The weight value of the required calibration weight is displayed
  without weight unit; e.g., "+ 5.000"
– Center the prompted weight on the weighing pan (e.g. 5.000 kg)

Important:

**The balance/scale will only accept a weight that is within a
tolerance range of approximately 2% of the nominal weight. Any
greater error can only be adjusted using the service   software.**
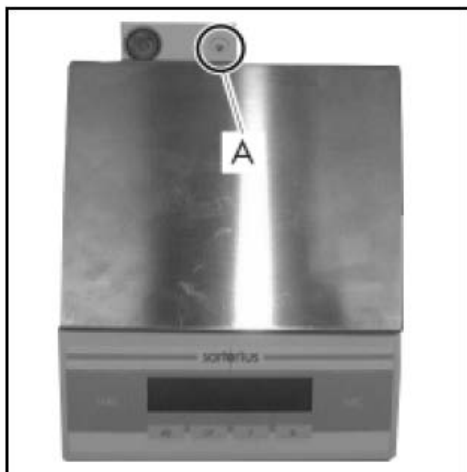
Opening and Closing the Balance/Scale
- After the adjustment procedure, the weight is displayed with weight
  unit (e.g., "+ 5.000 kg")
- Remove the calibration weight
- Check the span again and adjust it if necessary
- Disconnect the balance/scale from power (remove the battery, if one
  is installed).
- Remove the weighing pan, as well as any shock absorber and/or pan
  support, and place to one side.
- Remove the Phillips screw (A).
- Remove the hood by carefully pulling it towards the front. Make sure
  that you do not damage the ribbon cable that connects the display
  PCB to the main PCB.

- The display PCB, main PCB and load receptor are now accessible.

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Replacing PCBs

In the case of defects, do not attempt to make any repairs at the component level, but replace the entire subassembly.

Replacing the Main PCB

Note:

Before replacing the main PCB, use the service software to read out and store the balance/scale's data record, if possible. If this is not possible, order a pre-programmed PCB, indicating the balance/scale model and serial number.

– Open the balance/scale (see page 9)
– Disconnect all cables
– Remove the fastening screws from the main PCB
– Remove the old PCB
– Take the zero-point offset resistor from the old PCB and place it on the new PCB
– Follow the above instructions in reverse order to install the new main PCB
– The balance/scale must now be programmed with the required data record (unless you have installed a pre-programmed PCB)
– The following factors must be checked and, if necessary, adjusted:
– Zero-point offset value
– Linearity
– Span
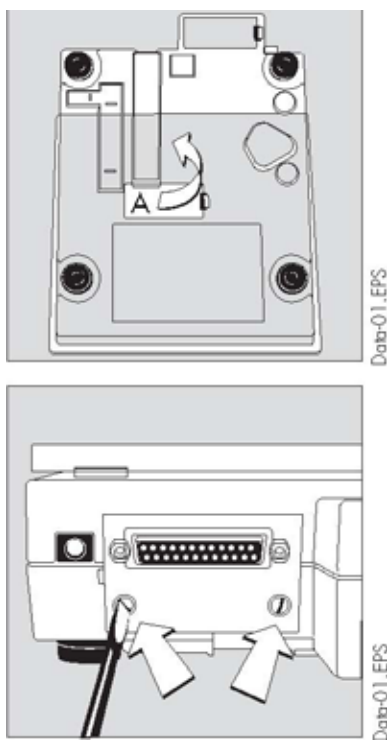
Installing the YDO01BL Data Output Port

– Open the balance/scale (see page 9)
– Lay the balance/scale on its side
– Remove the protective cap (A)
– Guide the ribbon cable from the output port through the opening in the balance/scale housing and plug it into the main PCB (make sure the plug and the positive/negative poles are in the correct positions)
– Replace the protective cap (A)
– Thread the ribbon cable from the output port through the guides provided for this purpose on the base of the balance/scale housing
– Turn the balance/scale upright
– Remove the plate from the back of the housing by pulling it upward
– Use the 2 screws to fasten the output port in the position made available by removing the plate
– Close the balance/scale
– Then test the output port with the following peripheral devices (as available):
– Sartorius printer; e.g., model YDP03-0CE
– Service software (SBI test)
– Data transfer software for PCs and laptops, e.g., Balance Reader

Overview of the Balance Operating Menu

1			**Balance/Scale Functions**	

1	**1**		**Adapt Filter**	
1	1	1	Minimum vibration	
1	1	2	Normal vibration	
1	1	3	Strong vibration	
1	1	4	Extreme vibration	

1	**3**		**Stability Range**	
1	3	1	¼ digit	
1	3	2	½ digit	
1	3	3	1 digit	
1	3	4	2 digits	
1	3	5	4 Digits	

1	**4**		**Weight Unit for Calibration Weight**	
1	4	1	Grams	
1	4	2	Kilograms	
1	4	3	Pounds	

1	**6**		**Auto Zero**	
1	6	1	On	
1	6	2	Off	

1	**7**		**Weight Unit 1**	
1	7	2	Grams	g
1	7	3	Kilograms	kg
1	7	4	Carats	ct
1	7	5	Pounds	lb
1	7	6	Ounces	oz
1	7	7	Troy ounces	ozt
1	7	8	Hong Kong taels	tl
1	7	9	Singapore taels	tl
1	7	10	Taiwanese taels	tl
1	7	11	Grains	GN
1	7	12	Pennyweights	dwt
1	7	13	Milligrams	mg
1	7	14	Parts per pound	o
1	7	15	Chinese taels	tl
1	7	16	Mommes	m
1	7	17	Austrian carats	k
1	7	18	Tola	t
1	7	19	Baht	b
1	7	20	Mesghal	m

2			**Application Programs**	

2	**1**		**Program Selection**	
2	1	1	Basic weighing function	
2	1	2	Toggle weight units	
2	1	3	Net-total(tare memory)	
2	1	4	Counting	
2	1	5	Weighing in percent	
2	1	12	Averaging	

3			**Appliction Parameters**	

3	**1**		**Weight Unit 2**	
3	1	2	Grams	g
3	1	3	Kilograms	kg
3	1	4	Carats	ct
3	1	5	Pounds	lb
3	1	6	Ounces	oz
3	1	7	Troy ounces	ozt
3	1	8	Hong Kong taels	tl
3	1	9	Singapore taels	tl
3	1	10	Taiwanese taels	tl
3	1	11	Grains	GN
3	1	12	Pennyweights	dwt
3	1	13	Milligrams	mg
3	1	14	Parts per pound	o
3	1	15	Chinese taels	tl
3	1	16	Mommes	m
3	1	17	Austrian carats	k
3	1	18	Tola	t
3	1	19	Baht	b
3	1	20	Mesghal	m

3	**3**		**Preset reference sample quantity / Reference percentage / number of Subweighing operations for averaging**
3	3	1	5
3	3	2	10
3	3	3	20
3	3	4	50
3	3	5	100

5			**Interface**

5	**1**		**Baud rate**
5	1	1	150 baud
5	1	2	300 baud
5	1	3	600 baud
5	1	4	1,200 baud
5	1	5	2,400 baud
5	1	6	4,800 baud
5	1	7	9,600 baud

5	**2**		**Parity**
5	2	1	Mark
5	2	2	Space
5	2	3	Odd
5	2	4	Even

5	**3**		**Number of Stop Bits**
5	3	1	1
5	3	2	2

5	**4**		**Handshake Mode**
5	4	1	Software handshake
5	4	2	Hardware handshake, 1 char, after CTS
5	4	3	Hardware handshake, 2 char, after CTS

6		**Print in Weighting Mode**

| **6**	**1**		**Manual/auto print mode**
6	1	1	Manual without stability
6	1	2	Manual with stability
6	1	3	Automatic without stability
6	1	4	Automatic at stability

7		**Print in Application Mode**

7	**1**		**Line Format**
7	1	1	Without data ID codes
7	1	2	With data ID codes

8		**Extra Functions**

8	**1**		**Menu Access**
8	1	1	Parameter settings can be changed
8	1	2	Read only

8	**2**		**External Switch Function**
8	2	1	CF Key
8	2	4	TARE Key
8	2	5	⊙ Key
8	2	6	F Key
8	2	8	TARE key

8	**3**		**Power-on Mode *)**
8	3	1	Off > on
8	3	2	Stand-by > on

9		**Reset Menu**

9	**1**		**Factory Settings**
9	-	1	Restore factory settings
9	-	2	Do not restore factory settings

*) Auto –On function
By setting a jumper on the main PCB or data interface PCB.

Error Code

Display	Cause	Solution
H	Balance/scale capacity exceeded	Unload the scale
L	No pan Something is touching the pan	Place the pan on the scale Remove whatever is touching the pan
E 01	Display overflow; i.e., the value to be output cannot be displayed	Reduce the load on the scale
E 02	Calibration parameter not met; e.g.,: - scale/balance not tared - load on balance/scale	Only start calibration when zero is displayed Press $\boxed{\text{TARE}}$ to tare Unload the balance/scale
E 10	$\boxed{\text{F}}$ key is blocked when there is data stored in the 2nd tare memory	Press $\boxed{\text{CF}}$ to clear the 2nd Tare memory
E 11	Value cannot be stored in the 2nd tare memory	Press $\boxed{\text{TARE}}$
E 22	Weight too light, or no load On the scale	Increase the weight on the scale
E 30	$\boxed{\odot}$ key pressed while BPF mode active	Set the scale to the SBI moe (e.g., by activating the "Close" function in the MC1 server)
E 50	Overflow or underflow in the temperature compensation converter	TK sensor or main PCB is defective (replacement required)
E 53	Temperature compensation converter is not functioning. the processor is not receiving any measured data from the TK switch	TK sensor or main PCB is defective (replacement required)
E 54	A/D converter output is below the Limit	The scale is underloaded; minimum Either the weighing pan/load Plate is not on the scale or There is a mechanical defect or A defect in the main PCB
E 55	A/D converter output is above the maximum limit	Either the scale is overloaded or there is a mechanical defect or a defect in the main PCB